

Hot Iron

Autumn 2010
Issue 69

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The Walford Electronics web-
site is also at
www.walfordelectronics.co.uk

Editorial

The start of another Construction Club year and the sun is out for the Bank holiday weekend, the harvest is in and it has also rained enough to get the countryside green again! Thankfully our clay ground held enough moisture for the corn yields to be reasonable despite the very dry spring/summer here. I also sense the economic climate is beginning to look up very slightly. The new Government has also had the good sense to put the Digital Britain plans on hold - by waiting for demand to be very much higher before deciding whether and when to shut down Band 2 analogue FM broadcasts. No doubt that the public campaign run by Rob Mannion in PW and the national press has had a significant impact - well done!

Yet another positive thing is that my file of raw material (from others) for this issue of Hot Iron is rather fuller than normal! Thank you to all who have contributed notes - it makes my life much easier and makes it so much more interesting for members to read! Keep it up please!

Some of you kindly came for QRP in the Country here this year - and since I have not got a suitable new rig photo to put below, I will give the rest of you a glimpse of what you missed! The 'Planks' are being earnestly discussed by Gerald G3MCK and others! Note the date for next year now - QRPiC 2011 Jul 17th!

Tim G3PCJ

Kit Developments

Farming has been a pesky intrusion this last few months so not much time for radio - but the new Mini CW and Mini AGC kits are now available as accessories for most rigs. In the last month, I have been trying out a very early version of a new 'CW trainer' kit called the **Radlet** which then becomes a complete CW TCVR! See later.

A recent talk to the Yeovil Club about the **Tone** also brought home the need for a low cost entry level DC RX - I am currently working on concepts for this which will hopefully get the price down to the sub £30 region. It will be called the **Yeo**. Tim G3PCJ



Hot Iron is a quarterly subscription newsletter for members of the Construction Club. Membership costs £7 per year with the first issue for each year appearing in September. Those people joining later in the year will be sent the earlier issues for that year. Membership is open to all and articles or questions or comments or notes about any aspect of electronics—principally on amateur radio related topics—is very welcome. Notes on member's experience building their own gear, from kits or otherwise is most interesting to other constructors. To keep it interesting, your thoughts and ideas are required please! For membership, I only need your name and address and subscription. Send it or any other suggestions to Tim Walford, Walford Electronics, Upton Bridge Farm, Long Sutton, Langport, Somerset TA10 9NJ © G3PCJ

QRSS – The Real QRP - Doing more – with less - by Andrew Atkinson

I first started getting interested in QRSS about eighteen months ago, and I have to tell you, it is one of the most fascinating and enjoyable aspects of our hobby that can be found. Well, for me at least, it certainly is. So, what is QRSS? Quite simply, it is the sending of a morse signal very, very slowly using no more than a fraction of a watt. How slow is 'slow'? The QRSS10 standard equates to a dot length of ten seconds and a dash length of thirty seconds. How do you hear it? Strangely, you don't, you hook up the audio output of your receiver to the soundcard of your computer and let some very sophisticated (and free) software do the rest for you. Perhaps I have made this all sound a bit complicated thus far, so I'll slow down a bit and go through all of the steps in more detail. I should also add that it is almost impossible to convey all of the information you need in the space of a short article such as this, so take the time to visit www.g4cwx.com and select the QRSS link on the right hand side of the screen for useful links, contacts and a lot more besides.

Why do it? I suppose the real question is "Why not do it?" To start with, QRSS is not hungry on bandwidth. Typically we only use a 100 Hertz segment of the lower end of the 30 metre band. With such a narrow window in which to work, we each limit ourselves to only a few Hertz of that allocation. Less output power also means less input power required. Hence I run my transmitter from a gel cell battery hooked up to a small solar panel for recharging.

Surprisingly QRSS has been going from strength to strength since it first started about 8 years ago. Initially the tests were conducted over relatively short distances, but as time passed the power levels have decreased and the distances over which signals have been heard has increased significantly. On 30 metres, for example, it is fairly common to be received in the USA on a lot less than 100 milliwatts - many people use much less power than that - even microwatts. This often equates to something approaching 8 million miles per watt - not bad performance for such a mode of operation. As each month passes we see a steady increase in the number of amateurs around the world both transmitting and also setting up "grabbers" to receive QRSS signals and display live digitised feeds on the internet. It has now become incredibly easy to set up a small station and some companies are even selling specially designed kits specifically for this emerging market.

Receiving QRSS This is, without doubt, the easiest bit. I am going to make an assumption that you have an HF amateur bands receiver of some sort. Connect the output of the audio to your computer soundcard input. I use a commercial interface to save the possibility of blowing something up, but it is easy to construct a small opto-isolator circuit. Now download the free "Argo" software, tune your receiver to 30 metres and you are ready to start receiving QRSS signals.

Although the easiest mode to transmit is plain CW, you will also find examples of DFCW, FSCW, Slowfeld and lots more besides. The Argo screen on your computer will display a form of waterfall which makes the QRSS signals stand out as white dots and dashes against a dark blue background. Whilst Argo is, without doubt, the easiest to get up and running, it is by no means the best tool in the box. Spectran and Spectrum Lab are excellent tools, but they do take time to learn. This might sound a bit like cheating, but if you do not want to go to the trouble of setting up your own receiving station, you could always have a look at Claudio's (I2NDT) web site <http://digilander.libero.it/i2ndt>. Then select "Knights QRSS Compendium Grabber". This is where many of us have our grabbers showing live received data on line updated every minute or so.

Transmitting QRSS Frequency stability is essential. Simplicity is the best approach - a crystal ('ovened' ideally) controlled transmitter with a small amount of frequency shift from a varicap or LED diode is sufficient. The only other requirements are a stable power source and a keyer. The latter can be purchased from one of the "Knights" - check my web site for more information. I suggest initially connecting the transmitter to a dummy load first and watching the output from an Argo screen on your computer. This will show you very clearly exactly how stable your transmitter is - and also whether it is in band. So, if all is well, you can now connect your aerial and start watching the other grabbers around the world to see if you can identify your signal.

More information One of the really enjoyable aspects of QRSS is that you suddenly become a member of a very exclusive club. Everyone involved is incredibly supportive and more than willing to help newcomers. There is a truly first-rate mailing list (reflector) which shows what is going on. There are details about propagation, bands in use, and much else. So, the first thing to do is visit my website. (Andrew sent some screen shots but they don't photocopy well - photos of some kit on next page! Tim) Then start receiving some QRSS signals yourself, get your TX out and I hope to see your signal! If I can help in any way, please email me at andrew_atkinson@hotmail.com

Invisible Aerials by David Proctor

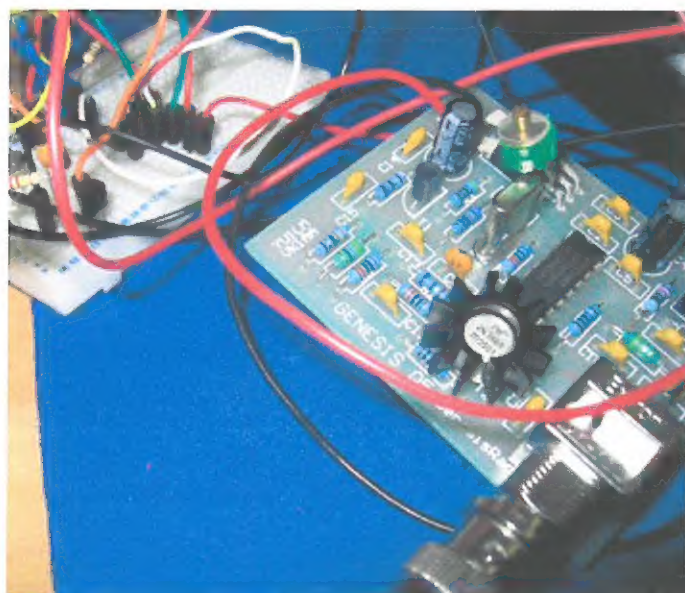
Back in the 50s when I was an SWL I always had room to put up a decent long wire, or dipole. Now, somewhat older, we have moved to a nice house but with a small garden. The front is open plan (no aerials) and the rear garden is 35 feet wide and 35 feet long, where it meets a 10 foot wide stream, beyond which are 60 foot chestnut trees. This is in the North York Moors National Park, so any new aerial needs approval by a committee that probably don't understand what amateur radio is all about.

A hidden aerial was therefore needed – but what? I considered all sorts – thin long wires – and dipoles that would have to be bent. Then I thought of a loop - why not wind it round the house as high as possible? Then the plastic gutter came to mind. Loops are inherently balanced (depending in their symmetry) so no earth is required. The house is 25 feet wide, and the side gables 27 feet long: this gives a loop of 104 feet, or 31.7m. I ran a plastic covered 24swg wire round the house, but looped out into the back garden to get the total length up to 40m. One neighbour asked what the "strings" were in the garden! The diameter of the wire with plastic is over 1mm, so I am about to use 0.56mm bare copper wire in the garden bit of the loop to reduce visibility.

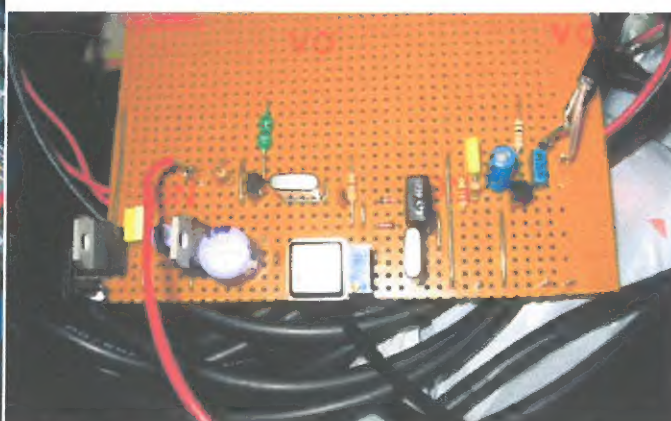
My present shack is in an upstairs bedroom (not far from the gutter!) so a very short length of 300R feeder into a 4:1 impedance transformer feeds the ATU and into the rig. As to results:- being a QRP CW person, and when compared with a 40m dipole, the loop seems to do well. It loads up OK on 20, 30, 40 & 80m and I have worked round Europe with 5 Watts. Durability of the wire is my only concern. The wire in the gutters is stationary and has shown no deterioration in two years, but the wire in the garden is sometimes brought down by flying mallard ducks that fly over the stream – so I am raising the fixing point (they do not fly so high!).

I would recommend the plastic gutter loop to anyone with space restrictions, because you can't see it, it is balanced, and it works!

Comment by G3PCJ. I understand that David has his wire laid mostly in the gutter, so it is immersed in water when its raining! I just wonder if it might be less lossy if it was below the actual gutter - some gutter support brackets have a small gap between them and the half round of the gutter itself which might allow the wire to be held pretty close to the bottom of the gutter to keep it concealed. If this is not too important it could be allowed to sag a little between the brackets (or even alternate ones) to further separate it from the water! It would be interesting to know what the house's internal pipe-work does to the radiation pattern!! David - something to evaluate and report in Hot Iron??!!

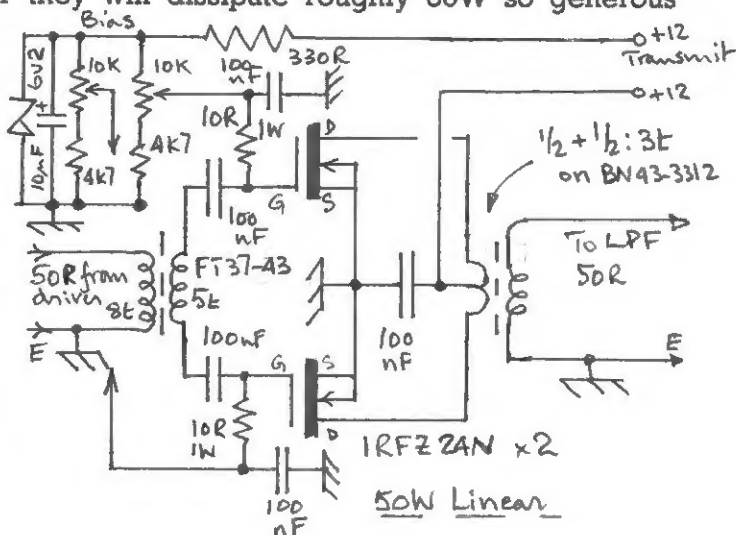


This is some of the kit that Andrew Atkinson uses for QRSS - on left is the 30m Genesis transmitter with bread-boarded keyer, and below is a Poliakov design RX for 30m.



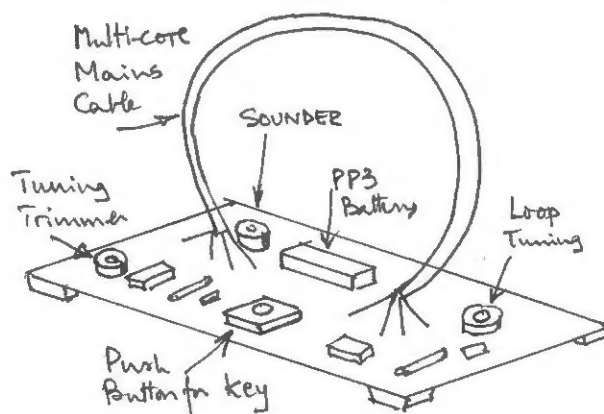
50 Watt Linear suggestions

Charles Wilson kindly sent along some ideas for a 50W Linear to run off a nominal 12 volt supply on 40m. It uses a pair of IRFZ24N MOSFETs in a push pull configuration. The original scheme had temperature sensed bias circuitry but with careful use I doubt this should be necessary - a stable DC voltage should be OK for MOSFETs as the idling current should decrease as they get warmer. When running at full power they will dissipate roughly 50W so generous heatsinks will be needed, or smaller ones with a blower. The nominal 5W input (50R) drives a broadband transformer that feeds the two device gates. To deal with the high gate capacitance, the transformer is loaded by 10R 1W resistors on each side. Given the lack of anything to force driving symmetry, individual bias presets are desirable so that each device has an idling current of about 120 mA, which can be tweaked for least harmonic output. The output transformer has a centre tapped primary and should feed a low pass filter to remove unwanted harmonics. These devices could take higher supply voltage for more output! G3PCJ



The Radlet

This is a novel design that starts life as a CW trainer and turns into a full blown CW TCVR! It had its origins in something for Morse code practice between two people. Initial ideas were a squeaker with connecting wires. Andy Howgate thought it would be a much better if the students could practice adjusting a receiver and work from room to room without wires! His idea was for two very simple TCVRs with short aerials. Back to drawing board with much head scratching - short aerials are OK at VHF but would these students be able to build a simple VHF rig - NO! (Nor would it be cheap!) Consider using HF loop aerials - but how to make them a practical size - that needs multiple turns. How about multi-core mains fixed installation electrical cables which might just be stiff enough? This possibility seems viable so how to make a rig that has a very low parts count, and yet is worthy of the name of TCVR and not 'toy'? I eventually hit on a TX output stage that can also act as a strong receiving mixer - and it is fundamentally broadband too! The builder can start with the sidetone for one-on-one sessions and then add the RX, and eventually the TX/loop. I anticipate that even on a 9v battery they will work over half mile or so. With a full sized aerial it should be pretty good and ought to do any single band 20 to 80m with a crystal or ceramic resonator. It will of course be compatible with a normal TCVR. I have yet to try it out properly and make certain that chirp and the like are not a problem - so no orders just yet! Target price for a single kit is under £30 or two for about £55! The basic kit will have a (very) small LS, PP3 battery holder and push button for key, in a flat open format, but an optional extra kit will provide full sized controls for serious use. The sketch right shows the concept! Keep your fingers crossed!



The Yeo

This new DC RX is for entry level Club Construction projects. (The Knole is too complex/expensive for this.) The aim is to have a decent DC RX that can eventually work with a TX if required rather than a toy which is built and then neglected. I hope to get the price down to £29 (including PP3 holder and LS) with full sized AFG pot and PolyVaricon main tuning of 3 sub-bands selected by a toggle switch. The operating band to be builder's choice of 20, 30, 40 or 80m. This will be open style in the small upright PCB front panel format. The devices will be the ubiquitous SA602 and an 072 dual op-amp plus an output buffer stage. Watch website for progress! G3PCJ

Three Books - reviewed by John Teague G3GTJ.

In my opinion the paramount book on amateur radio to be published for decades is the ARRL's "Experimental Methods in RF Design." It has set a standard against which I measure other books - not that I buy many - but I find that as middle age begins to be overtaken by old age the inclination to read about what one might be doing in the workshop tends to displace actually picking up the soldering iron and making hardware. Thus less money is spent on kits and more on books and I always happy to find companions for Experimental Methods in my "Shopping Book" category. These are books always ready to be snatched up when my wife tells me as we set off for somewhere "I just want to pop into Tesco on the way" and are dipped into while she combs the store. There is always something interesting to read or re-read; shopping books have to have plenty of circuit diagrams, technical discussion and related equipment photographs to qualify.

The books, all published by the RSGB within the last twelvemonths, are "HF Antennas for Everyone" 330 pages compiled by Giles Read, G1MFG; "International QRP Collection." 174 pages edited by George Dobbs G3RJV and Steve Telenius-Lowe 9M6DXX and lastly "Homebrew Cookbook" by Eamon Skelton EI9GQ. None of these books is expensive and all are fair value for money. The disc is George Dobbs' "Regenerative Receivers" which I will leave until last.

I will start with the most recent publication, **Homebrew Cookbook**. Despite being an enthusiastic reader with a file of clippings from Eamon Skelton's regular articles in Radcom this book proved to be a surprise. Although all the material has appeared already, it is two years old and a really excellent editing job has been done in rearranging it under topic headings - "Building a Receiver, Frequency Measurement, Transmitting Projects and Aerials." There is also an introductory chapter "Construction Methods." Time and the good editing add up to a refreshingly different presentation of the original material and I enjoyed it very much. Skelton's writing is authoritative, clear and all is related to recently built equipment. I have no serious quibbles but I would have liked more advice on component sources.

International QRP Collection is also very good and meets the shopping criteria well. It is assembled from a wide range of sources including QST, Sprat, Practical Wireless and Radcom. Rick Campbell, a principal contributor to Experimental Methods has a two part paper "Designing and Building Transistor Linear Power Amplifiers which is well up to his usual high standard. There are also several papers on pedestrian and bicycle mobile which interested me, mainly because the techniques are often profitable at the home station.

Lastly we have **HF Antennas for Everyone** published in April. Drawn exclusively from Radcom, this book provides discussion of about 100 different amateur antennae with constructional details. The text is divided into sections "Horizontal, Vertical, Loop and Stealth" with as final chapter on feeders. A few off beat aerials are included - toroidal, HF slot and helical but the Hatley and other Poynting vector synthesis proposals are ignored. It is full of practical and useful information but not quite in the shopping class in my view.

So there we are - **good reading** !

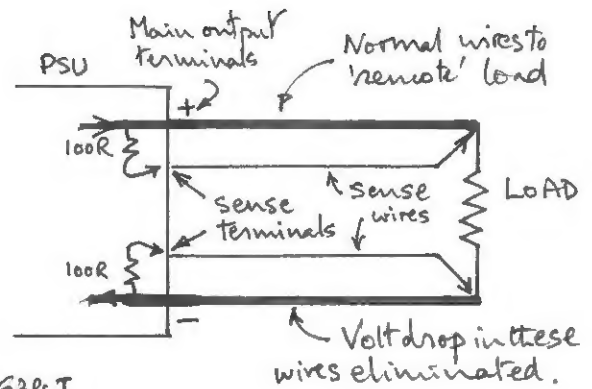
Power Supply Miscellany

Remote Sensing Most relatively modern PSUs will have a voltage regulator to ensure that the output does not change appreciably as a load is applied. While not quite so common nowadays, the open style of rack mounted supplies that are often found at rallies, often have four output terminals. Two are for the load proper and two are for feeding back the actual load voltage to the regulator circuits; in this way the load voltage can be kept constant even with long leads where their resistance is high enough to cause a significant voltage drop under full load. Quite often, there is a low value resistor (about 100R) between each pair of terminals, for the separate output leads. Their inclusion will allow the regulator to work even if the separate sense wires are absent or broken - but IR losses in the main leads will not be compensated!

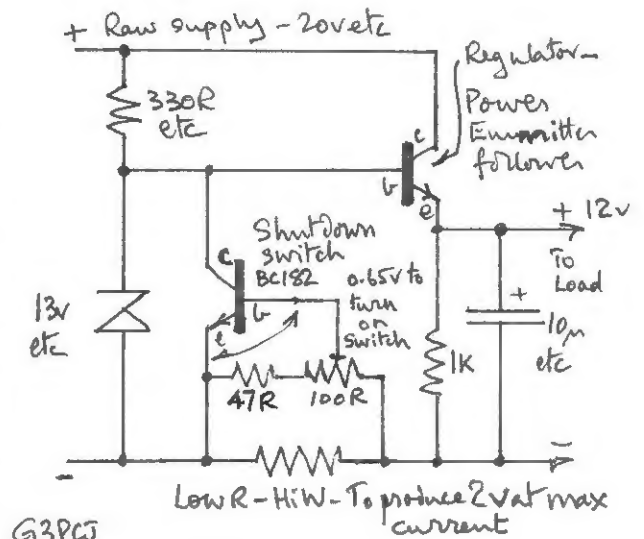
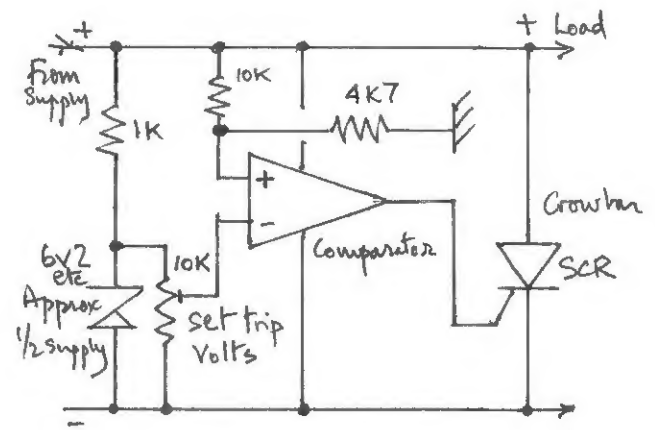
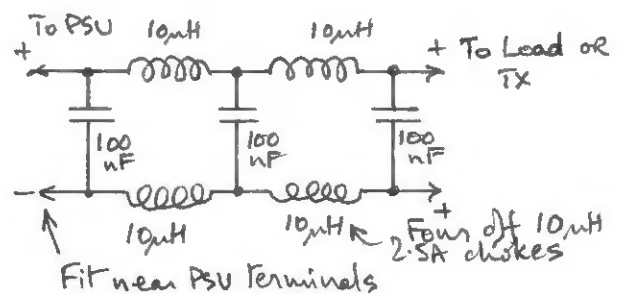
RF wrecks regulation! The regulator circuits often have a wide bandwidth (hundreds of KHz) to ensure that the regulator acts swiftly when the load changes very quickly - either coming on or off. This transient performance is hardly ever specified but is an important aspect of the design. This means that the regulator can be a bit prone to RF getting in from transmitters. I have one supply where I found it was very sensitive to RF just after it went out of warranty! Go to transmit and the output voltage rises appreciably! Not the effect you would expect! I have found that low pass filters made with high current inductor chokes will often effect a cure. Try the circuit right!

Over voltage protection The purpose of this is to prevent damage when the output voltage suddenly rises above some set limit that might damage the load circuits. It is usually only fitted to fixed voltage supplies as it can be tricky to set the turn off level for variable supplies without complex circuits. It is not the same function as that provided by the regulator. The load voltage is compared with the set trip voltage, so that when it is excessive, the regulator is shut down. Alternatively, it can fire a 'crow-bar' SCR across the PSU output to blow the fuses or shut it down until switched off.

Over current protection This is very useful on bench supplies when experimenting with a new rig! Often an excessive current may indicate a short on a supply line or some circuit malfunction such as a bipolar transistor cooking with thermal runaway. If in doubt about what current to expect set the trip level low. The very simple regulator shown right depends on the load current flowing through a low value resistor, that is used to turn on a second transistor which shuts down the regulator. Max current through the low value R needs to produce about 0.65v to turn on the bipolar transistor. If the setting is to be adjustable, then use a higher value resistor with a low value pot across it. The low R sense resistor must be high wattage! Tim G3PCJ



G3PCJ



G3PCJ

Snippets and Customer Feedback!

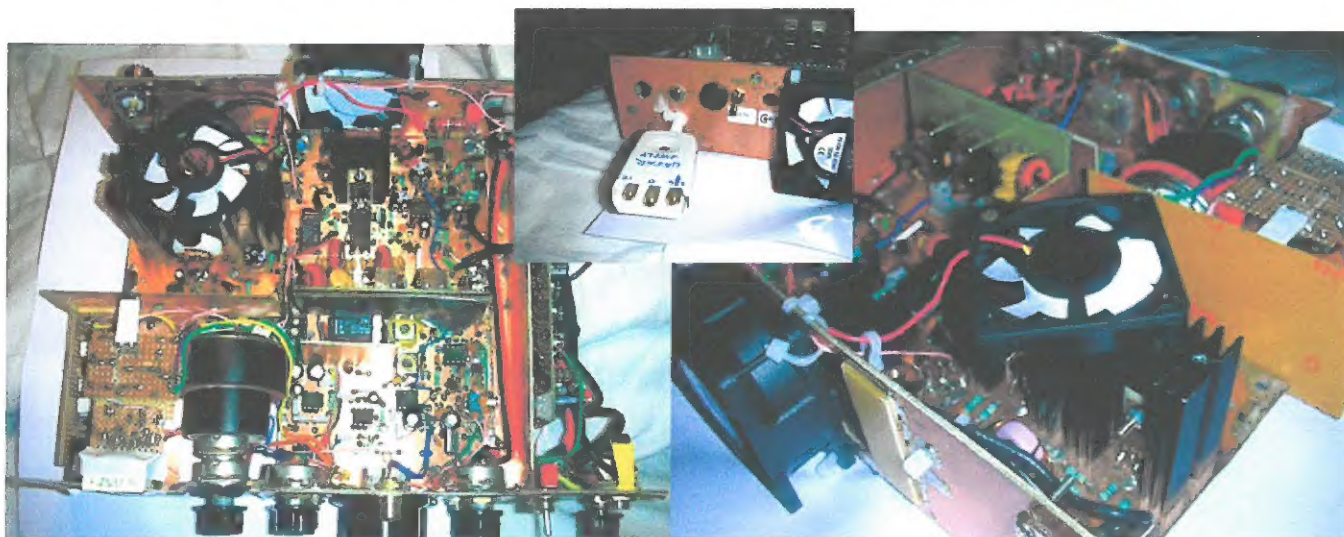
Hello Tim from Fred G3TWN on Anglesey. Just to let you know how the builds are getting on. The Brent I bought in May was completed in September and works very well. I have worked OK, DK LA and G's and I am very pleased with the rig. Due to building the Brue 40 I have not operated much. The Brue was much easier to build than the cramped Brent but having said that I engaged on a difficult mechanical build. Fitting a slow motion drive involved extra time and I had to fit the mixer above the main board separated with one sided board to avoid spongy transmissions. Noise is problem here and I have fitted a RF gain control at the rear. 7 MHz is poor at the moment but good for testing on WW CW contest weekend. I have been using the Digipan waterfall to check the audio out. The filter shows up well and I can see that the VFO/Mixer is stable. It has helped me choose pot levels correctly to avoid noise. PSK31 decodes ok too!!!. I tuned the mixer trimmers with my trustee Heathkit GDO and weeks later they proved to be correct in practise. I hope to get operating with Brue now I have declared it finished. Congratulations on your kits and thank you. Cheers. *Thank you Fred - very pleased to hear that PSK31 works - I have often been asked!* Tim

20w output on 160m (aka. How to be heard above domestic QRM on topband!)

With mounting frustration that most amateurs I talk to on topband couldn't hear me above their 8 s-points of local QRM, I determined to do something about it! A few years ago I built the Walford Sutton Montis, a multi-band Double-Sideband rig with 1.5w output. I added all sorts of features and in particular Tim's 10w linear with everything all connected together as one rig. A reasonable output on all bands was a compromise though and on 160m I was only able to put out 4.5w! My objective was to raise the output to at least 15w and for the rig to cope with long waffle overs. Being a thermo-neurotic, I had visions of IRF510s going up in smoke and so I planned to site a fan on the top of the linear heat-sink from the start (with rubber washers) and to site another fan behind the transmit board heat-sink. There are many quiet fans available now aimed providing PCs with quiet cooling. The two I chose were Fractal Designs 12v 50mm 'silent' PC fans and with a 2w 50 ohm resistor in series with 13.8v they were running quietly at around 11v. For the linear power supply, I bought a 24v 6A switch mode supply which was ex-rack equipment to a high spec and six 50v 6A Silicon Diodes. My thought was that the power supply would tweak down to 21.5v and the diodes in series would potentially bring the voltage down perhaps to 17v. The diodes only dropped 0.3v each however, so a bit of a non-starter!

The rig continues to have a 13.8v supply for everything other than the linear and I wanted to optionally run the linear either on 13.8v or the higher voltage linear supply. The easy solution was to use 3 pin10A mains extension lead connectors. The idea being that 24v nominal could be passed to the rig through one of these for normal running and a 'dongle' could be made out of another connector to feed the 13.8v back in to the linear if lower voltage running was required. I started tests at 19.5v but quickly brought the volts up to 24.0v to produce up to 20w output on 160m. At 24v on long waffle overs it produced around 20w output on 160m, the heat-sink warms up only mildly. It could take a bit more but 24v is enough for me and I'm more than happy with the results! Here is the Sutton with the fan on top!

David Brewerton MOEZP



QRP in the Country –2010

On Saturday, the weather forecast suggested Sunday would be dry. So plans for Sunday were based on everything being outside, which was a great help. It allowed all those staying here on Saturday evening to join us at a Summer Party run by the Friends of Long Sutton church - this was a great diversion as it was near compulsory fancy dress with a 1940s theme! We even had Winston Churchill turn up in a suitably old chauffeur driven car and there were numerous spivs in attendance!

Sunday started cold and windy but at least it was dry. The kite and huge Union Jack, tethered by an 80m vertical dipole and feeder, promptly rose to 180 ft - the flag's attachment lines lasted less than an hour and it had to be recovered from our garden! The rest of us spread our stalls around the field using three farm trailers, gazebo tents, tables etc. We had visitors from far and wide, as well as good support from 'our locals' in the south west of England. My thanks to all who came and especially the many helpers - local Clubs, individual 'stall' holders, without whom it would have been impossible to put on this event. The list is too long to include here but I must highlight the role of all The Ladies who provided the most excellent support service (food) - they did a grand job despite the wind trying to extinguish the barbeque! As the day progressed, the wind died, the sun came out and a great time was had by all. With so many positive reports afterwards, we have to hold it again - Jul 17th 2011!

If any readers of this note are able to encourage your local Clubs etc or individuals to attend and put on any sort of interesting display, then please do so and get them to drop me a line at walfor@globalnet.co.uk. Here is a selection of the sights! Thanks to Tex Swann for some of these pictures.



Giving the thanks to helpers and my wife Janet leads the returning farm excursion! G3PCJ